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October 19, 2012

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Toxics Cleanup Program

Department of Ecology

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**Re: Whatcom Waterway Site – Consent Decree No. 07-2-02257-7 - Pre-Remedial Design Investigation Work Plan Addendum #2  
Central Waterfront Site –Agreed Order No. DE 344 –RI/FS Work Plan Addendum #4  
Supplemental Central Waterfront Shoreline Design Investigation**

Dear Lucy and Brian:

Anchor QEA, LLC, is currently conducting remedial design and permitting activities in support of the Whatcom Waterway Site Cleanup project. This work is being performed in accordance with the First Amendment to Consent Decree No. 07-2-02257-7, which was filed in Whatcom County Court on August 19, 2011. The design and permitting work is being performed on behalf of the Port of Bellingham and other signatories to the Consent Decree. In addition, ongoing Remedial Investigation and Feasibility Study (RI/FS) activities are being performed at the Central Waterfront site in accordance with Agreed Order No. DE 3441.

## **1. PURPOSE AND BACKGROUND**

In support of the Whatcom Waterway engineering design, supplemental geotechnical and environmental data needs have been identified relating to the partially-exposed containment wall and Maple Street bulkhead replacement design along the northern shoreline of the Whatcom Waterway site. The shoreline is located within the cleanup area of the Whatcom Waterway site and includes the southern portion of the Central Waterfront site where the

presence of concrete debris and petroleum impacted soils and groundwater has been documented.

This work plan identifies the methods to be used to collect the geotechnical and environmental data needed to support the wall and bulkhead design. The work described in this document will inform the ongoing Whatcom Waterway design effort, and the results will be incorporated into the Phase 1 Engineering Design Report. Additionally, this work will inform the anticipated revisions to the Central Waterfront RI/FS, which is currently undergoing Ecology review.

## **2. INVESTIGATION METHODS**

Figure 1 shows the locations of the proposed geotechnical and soil analytical testing. The testing locations will be confirmed in the field along the transects shown on Figure 1 based on the presence/absence of subsurface concrete debris. Tables 1 to 3 summarize the investigation tasks and respective sampling and testing details.

### **Health and Safety**

All site investigation activities will be performed in compliance with the site-specific health and safety plan. Both public and private utility locates will be performed prior to subsurface sampling.

### **Wall Alignment Survey and Marking**

A licensed surveyor will survey and mark the alignment of the proposed partially exposed containment wall and Maple Street bulkhead replacement along the shoreline as shown in Figure 1. In addition, the surveyor will survey the location of existing utilities and observed stormwater system features (e.g., catch basins). Permanent survey point markers will be installed to allow access to the future wall alignment marking throughout the design development as needed.

### **Concrete Debris Survey and Soil Analytical Testing**

Borings will be advanced by direct push (Geoprobe™) methodology to delineate the presence/absence of subsurface concrete debris and petroleum and metals contamination

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along the proposed wall and bulkhead replacement alignment. We anticipate completion of seven transects at the approximate locations shown in Figure 1. These locations may be adjusted during sampling based on access considerations or other factors. Direct push borings at each transect will first be completed approximately 5-feet from the shoreline along the wall alignment markings and then move away from shore if concrete debris (i.e., refusal) is encountered at shallow depths. Borings will be moved approximately 5 to 10 feet away from the first attempt until concrete debris is not encountered or a maximum of 20-feet from the first attempt.

The first boring at each transect where no concrete debris is encountered will be completed to at least 15-feet below ground surface (bgs) and continuously logged and sampled at select depth intervals. Soils observed in these borings will be logged by the field geologist, including the soil type, presence of debris, hydrocarbon sheens, stained soil, or odors. Target samples intervals will consist of approximately 3-feet bgs (overburden) and 7-feet bgs (smear zone). Additional archive soil samples may be collected based on field observations at the time of sampling. Soil samples will be field screened for potential hydrocarbon contamination using photo-ionization detector (PID) headspace screening and sheen-tests. Direct push borings locations will be field-verified using DGPS.

Soil samples selected for analysis will be analyzed for TPH-Dx (with silica-gel cleanup), TPH-G, BTEX, and priority pollutant metals (Table 2). Quality assurance samples will include analysis of one field duplicate for each analytical method. Laboratory analyses will be performed at Analytical Resources, Inc. (Seattle).

### **Geotechnical Sampling and Testing**

Two upland geotechnical borings will be completed along the shoreline areas shown in Figure 1 to supplement previous geotechnical data collected in 2008 as part of the Whatcom Waterway Pre-Remedial Design Investigation (PRDI). One additional geotechnical boring may be advanced to the west (project west) of these two borings dependant on time remaining in the work day following completion of the first two borings. Geotechnical borings will be completed by hollow-stem auger methodology to an anticipated depth of 60-feet bgs. Geotechnical information is required in order to support further engineering design of the proposed partially-exposed containment wall and Maple Street bulkhead replacement.

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The geotechnical testing parameters are presented in Table 3. Sampling will utilize two samplers, a standard penetration split-spoon (2 inch outside diameter, 1-3/8 inch diameter opening) and Shelby tubes (3-inch diameter, thin-walled). The geology at the site primarily consists of granular soils (fill and alluvium) overlying silt and clay (Glaciomarine Drift). In the granular soils, Standard Penetration Testing (SPT) will be performed using the standard split-spoon in intervals of 2.5 to 5-feet with blow-counts being recorded at each sample location. Using a 140-pound hammer, free falling 30 inches, the sampler is driven into the soil for 18 inches. The number of blows required to drive the sampler the last 12 inches is the Standard Penetration Resistance. This resistance, or blow count, measures the relative density of granular soils and the consistency of cohesive solids. The blow counts are plotted on boring logs at their respective sample depths.

Samples recovered from each SPT will be stored and submitted for either laboratory analysis or archiving. Tests performed will be grain size and #200 wet-wash for estimating the fines content. For each boring, sampling in the clay and silt will consist of two Shelby tubes samples – one in the upper 5 feet of the soil unit and one approximately 10 feet deeper. Each Shelby tube will be capped and sealed after extraction from the bore hole and stored upright free of elevated temperatures. Shelby tubes will be transported in a secure manner so as to minimize sample disturbance. The Shelby tubes will be submitted to the lab for geotechnical testing – moisture content, specific gravity, Atterberg limits, undrained-unconsolidated tri-axial compression tests (UU-TX), and one-dimension oedometer tests (consolidation). A chain-of-custody (COC) form will be logged by the processing staff and relinquished to the laboratory.

Anchor QEA personnel will record field conditions and drive notes on a standard boring log. Logs will include the following information:

- Date and time of collection of each boring;
  - Names of field personnel collecting and handling the samples;
  - Observations made during sample collection, including weather conditions, complications and other details associated with the sampling effort;
  - The boring station identification;
  - Qualitative notation of apparent resistance during driving
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If dense materials preclude driving the total 18-inch sample, the penetration resistance is entered in one of two ways: 1) if less than 6 inches, enter the total number of blows over the number of inches of penetration on the boring log; and 2) if greater than 6 inches, sum the total number of blows completed after the first 6 inches of penetration. This sum is expressed over the number of inches driven that exceed the first 6 inches (the number of blows needed to drive the first 6 inches are not reported).

Anchor QEA field staff will log hollow-stem auger samples on-site. Table 3 presents a summary of the geotechnical sample collection depth intervals. Prior to sampling, Anchor QEA field staff will take color photographs. Additionally, field staff will log the description of each sample core on a standard boring log. The following parameters will be noted:

- Sample recovery;
- Physical soil description in accordance with the Unified Soil Classification System (includes soil type, density/consistency of soil and color);
- Odor (e.g., hydrogen sulfide and petroleum);
- Visual stratification, structure and texture, vegetation and debris
- Presence of petroleum-like sheen.

### **3. DATA ANALYSIS & REPORTING**

The investigation findings will be summarized in a data memorandum. The investigation findings will be incorporated into the Whatcom Waterway Phase 1 EDR, and will also inform the pending revisions to the Central Waterfront RI/FS. The memorandum will include the following:

- Summary of investigation methods and findings
- Figures and tables summarizing field observations and compiled analytical and geotechnical data
- Copies of boring logs, data validation findings, and analytical laboratory reports

Following completion, electronic data will be submitted to Ecology consistent with EIM data transmittal requirements.

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#### **4. MANAGEMENT OF INVESTIGATION DERIVED WASTE**

All rinse water and residual soil obtained during sampling and decontamination activities will be disposed of in 55-gallon drums and consolidated. The 55-gallon drums will be located in a secure on-site area and appropriately labeled, pending waste characterization and disposal.

All disposable sampling materials and personal protective equipment used in sample processing, such as sample liners, vinyl gloves and paper towels, will be placed in heavy duty garbage bags or other appropriate containers. Disposable supplies will be placed in a normal refuse container for disposal as solid waste.

#### **5. SCHEDULE**

Field activities are scheduled for the weeks of October 15 and October 29. The proposed partially exposed containment wall and Maple Street bulkhead replacement alignment and marking will be completed on Thursday October 18 and followed by boring clearance of on-site utilities by both public and private locates performed on Tuesday October 23. Direct push sampling will be performed on Thursday October 25 and Friday October 26. Hollow-stem auger sampling will be performed on Monday October 29. Data analysis and reporting will be performed immediately following receipt of results from the laboratory and data validation.

Sincerely,



Tom Wang, P.E.

Anchor QEA, LLC

cc: Michael Stoner, Port of Bellingham  
Brian Gouran, Port of Bellingham  
John Hergesheimer, Port of Bellingham  
Amy Kraham, City of Bellingham  
Halah Voges, Anchor QEA

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Attachments:

Figure 1 – Shoreline Design Investigation

Table 1 – Summary of Proposed Central Waterfront Site Shoreline Design Investigation






Table 2 – Soil Sampling Analytical Methods and Collection Details

Table 3 – Geotechnical Testing Parameters

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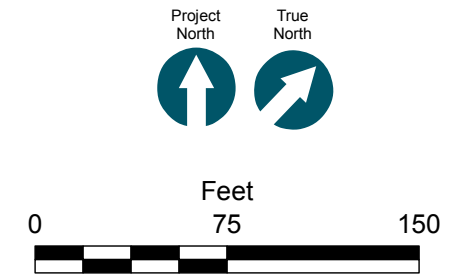


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-  Proposed Hollow-stem Auger Boring
-  Proposed Hollow-stem Auger Boring (Contingency Location)
-  Proposed Direct Push Boring Transect
-  Proposed Partially-Exposed Containment Wall
-  Proposed Maple Street Bulkhead Replacement

**Notes:**

1. Sampling locations will be confirmed in the field and may be adjusted based on access considerations or other factors.
2. Direct push borings at each transect will first be attempted approximately 5-feet from the shoreline and additional attempts will be moved in 5 to 10-foot increments or a total of 20-feet from the first attempt if concrete debris is encountered.
3. The first direct push boring at each transect to not observe concrete debris (i.e., refusal) will be continuously logged and sampled.
4. Two geotechnical borings will be completed with a third contingent geotechnical boring in the Former Chevron area completed as time allows during one work day.
5. Locations of proposed hollow-stem auger borings will be determined following completion of the direct push borings.



**Figure 1**  
 Direct Push and Geotechnical Sampling Locations  
 Central Waterfront Shoreline Design Investigation  
 Whatcom Waterway Cleanup Project



**Table 1**  
**Summary of Proposed Central Waterfront Site Shoreline Design Investigation**

<b>Task</b>	<b>Number of Sample Locations</b>	<b>Sample Collection</b>	<b>Overall Depth</b>	<b>Visual/Physical Observations</b>	<b>Laboratory Analyses</b>
Wall alignment survey	Survey wall alignment along shoreline area	--	--	Establish survey control points and mark proposed wall alignment along shoreline	--
Utility locate	Locate utilities along wall alignment and at proposed sampling locations	--	--	Mark existing utilities in areas along proposed wall alignment and sampling locations. Include marking of existing stormwater system features.	--
Direct push probe	7 transects of up to 3 borings each transect	Soil samples from one boring per transect. Up to two samples per boring: 1) approx. 3 feet bgs (overburden) and 2) approx. 7 feet bgs (smear zone). Sampling performed at boring closest to shoreline where concrete debris is not encountered.	Up to 20 feet bgs (where concrete debris not encountered)	Concrete/debris/physical obstructions. Log one boring in each transect for soil classification and visual/olfactory/PID evidence of petroleum impacts (first boring that does not encounter obstructions on Waterway side)	NWTPH-Dx with silica gel cleanup; NWTPH-G; BTEX by EPA method 8260 SIM, priority pollutant metals <sup>1</sup>
Hollow-Stem Auger	2 (up to 3) <sup>2</sup>	Continuous logging and selective soil sampling at each boring location.	50 to 60 feet bgs	Log each boring for soil classification and visual/olfactory/PID evidence of petroleum impacts. Record blow counts continuously.	Geotechnical testing <sup>3</sup>

**Notes:**

1. Table 2 presents the soil sampling analytical methods and collection details.
2. Two hollow-stem auger borings are planned for geotechnical testing as shown on Figure 1. A third boring will be advanced if time allows during one work day.
3. Table 3 presents the geotechnical testing parameters.

**Table 2. Soil Sampling Analytical Methods and Collection Details**

Parameter	Analytical Method	Laboratory Reporting Limit <sup>1</sup>	Sample Volume	Container Size and Type	Holding Time	Preservative
<b>Soil Analysis</b>						
<b>Petroleum Hydrocarbons (mg/kg dry weight)</b>						
TPH-gasoline range hydrocarbons	NWTPH-Gx	5.00	50 g	Purge and trap system for EPA Method 5035 / 2-oz glass, zero headspace	14 days	Cool/4° C
TPH-diesel range hydrocarbons/ TPH-heavy oil range hydrocarbons (with silica gel cleanup)	NWTPH-Dx	5.00/10.00	150 g	8-oz glass	14 days until extraction	Cool/4° C
					1 year until extraction	Freeze -18°C
					40 days after extraction	Cool/4° C
<b>Metals (mg/kg dry weight)</b>						
Antimony	6010C	5.0	25 g	4-oz glass	6 months (metals)/28 days (mercury)	Cool/4° C
Arsenic	6010C	5.0				
Beryllium	6010C	0.1				
Cadmium	6010C	0.2				
Chromium	6010C	0.5				
Copper	6010C	0.2				
Lead	6010C	2.0			2 years (metals)/28 days (mercury)	Freeze/-18° C
Mercury	7471A	0.025				
Nickel	6010C	1.0				
Selenium	6010C	5.0				
Silver	6010C	0.3				
Thallium	6010C	5.0				
Zinc	6010C	1.0				
<b>Volatile Organic Compounds ( µg/kg dry weight)</b>						
Benzene	8260C	1.00	50 g	Purge and trap system for EPA Method 5035 / 2-oz glass, zero headspace	14 days	Cool/4° C
Toluene	8260C	1.00				
Ethylbenzene	8260C	1.00				
Total xylenes	8260C	2.00				

**Notes:**

µg/kg = microgram per kilogram

ASTM = American Society of Testing Materials

mg/kg = milligram per kilogram

1 Specific quantitation limits are matrix-dependent. Quantitation limits listed are provided for guidance and may not always be achievable.

**Table 3. Geotechnical Testing Parameters**

Subsurface Exploration Location ID	Number of Samples <sup>1</sup>	Range of Sample Intervals	Moisture Content	Specific Gravity	Grain Size Distribution	#200 Wash	Atterberg Limits	UU-TX <sup>2</sup>	One-Dimensional Oedometer
		(ft to ft)							
CWS – B1	up to 15	2.5 – 10	6	1	4	4	1	3	2
CWS – B2	up to 15	2.5 – 10	6	1	4	4	1	3	2
CWS – B3 <sup>3</sup>	up to 15	2.5 – 10	6	1	4	4	1	3	2

**Notes:**

1. Actual number of samples is dependent on depth of boring soil types encountered
2. Unconsolidated-Undrained Tri-axial compression test
3. A third contingenet boring will be advanced if time allows during one work day.